4. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

$$f(x) = x^3 - 2x^2\sqrt{x} + 14 \qquad x > 0$$

(a) Solve the equation

$$f'(x) = 0$$

(5)

(b) (i) Show that the equation

$$f''(x) = 66$$

can be written as

$$4x - 5x^{\frac{1}{2}} - 44 = 0$$

(ii) Hence, using algebra, show that $x = 16$ is the only solution of the equation

$$f''(x) = 66$$

(5)

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Question 4 continued

Question 4 continued

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Question 4 continued

(Total for Question 4 is 10 marks)

5. The curve C has equation

$$y = -2x^2 + 12x + 7$$

(a) Write $-2x^2 + 12x + 7$ in the form $a(x + b)^2 + c$, where a, b and c are constants.

(3)

The point P is the maximum point on C.

(b) Find the coordinates of P.

(2)

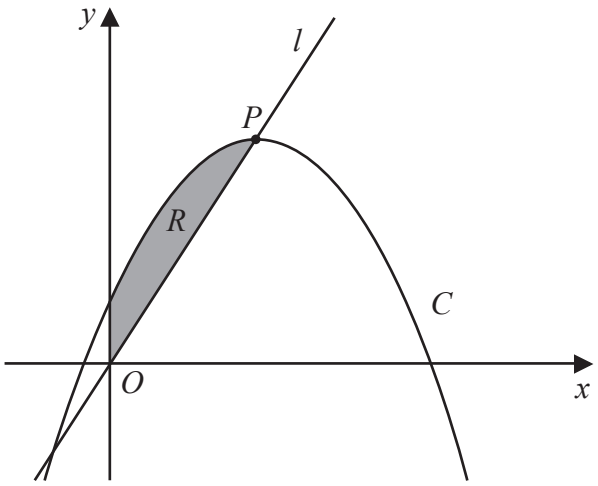

Figure 1

Figure 1 shows a sketch of the curve C and a line l.

The line l passes through the point P and the origin O.

The region R, shown shaded in Figure 1, is bounded by C, l and the y-axis.

(c) Use inequalities to define R.

(2)

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